

2. 1887, Haase, E.—Die Indisch-Australischen Myriapoden. Pt. I. Chilopoden. Abh. Ber. Zool. Anthropol. Mus. Dresden, 1887 No. 5. pp. 1-118, 6 pl.
3. 1891, Pocock, R. I.—On the Myriapoda of Burma. Pt. 2.—Report on the Chilopoda collected by Sig. L. Fea and Mr. E. W. Oates. Ann. del Mus. Civico di Storia Naturale di Genova. Serie 2, x. (xxx). 1890-91, pp. 401-432.
4. 1892, Pocock, R. I.—Report upon Two Collections of Myriapoda sent from Ceylon by Mr. E. E. Green, and from various parts of Southern India by Mr. Edgar Thurston of the Government Central Museum, Madras. Jour. Bombay Nat. Hist. Soc., VII. 1892. pp. 131-174, pl. I and II.
5. 1901, Pocock, R. I.—Some New Genera and Species of Lithobiomorphous Chilopoda. Ann. Mag. Nat. Hist. (7), VIII. 1901. pp. 448-451.
6. 1917, Silvestri, F.—On some Lithobioidea (Chilopoda) from India. Rec. Ind. Mus. XIII. 1917. pp. 307-314, figs. I-VI.

EXPLANATION OF FIGURES.

Fig. 1. *Archilithobius glennici*.—(a) Forcipules (one claw undergoing regeneration), (b) head, (c) mandible, (d) 1st maxilla, (e) 2nd maxilla, (f) last segment of 2nd maxilla, (g) ocelli—left side, (h) P. 1, distal region of limb, (j) genital appendages of female, (k) the same, specimen from Chakrata.

Fig. 2. *Archilithobius* sp.—(a) Forcipules, (b) ocelli—right side.

Fig. 3. *Archilithobius birmanicus* var. *chandellensis*.—(a) Forcipules, (b) teeth of forcipules, (c) labrum (foreshortened), (d) mandible, (e) mandible of another specimen, (f) ocelli—right side.

Fig. 4. *Lamyctes liani*.—(a) entire, (b) head, (c) labrum from below, (d) mandible, (e) 1st maxilla, (f) last segment of 2nd maxilla, (g) forcipules, (h) teeth of forcipules, (j) genital appendages of female.

ANNOTATED LIST OF CROP PESTS IN THE BOMBAY PROVINCE.

BY

K. N. TREHAN, M.SC. (Punjab), PH.D. (London),

Agricultural Entomologist to Govt., Bombay, Poona,

AND

S. V. PINGLE, B.SC. HONS. (Agric.),

Lecturer in Entomology, Agricultural College, Poona.

INTRODUCTION.

Economic entomology is very intimately associated with the crop production, therefore some knowledge of the more important pests is of the greatest significance. In the province of Bombay however, much attention could not be devoted to the study of various pests since the staff engaged was small and mostly occupied in teaching. Nevertheless, it has now been realised that the first essential necessity is to determine the identity and the activities of the insect foes, responsible for damaging our crops. The present publication therefore, aims at supplying such information to cultivators, garden-owners, district workers, propaganda officers, the revenue authorities, and also to students in the Agricultural College

and schools, regarding the insects, found infesting various crops in our fields.

Additional data in the form of life histories, seasonal activities, nature and extent of damage and above all, the control measures, is highly desirable but must be deferred till first-hand information under local conditions, is available. Efforts are being made to remedy these deficiencies and the results of our further investigations will be published in the second contribution from this Department.

At present however, it is considered desirable that data should be available about the pests, responsible for the damage to various crops, and as far as possible about their seasonal activities. With this view an almost complete list of the pests of our province is arranged under crop heads, and brief notes appended.

Sugarcane.

Saccharum officinarum is planted in January to March and June and harvested from December to May.

A. ATTACKING SETS AND ROOTS.

1. White ants—*Termes* sp. (*Termitidae*). Major pest all over the province. The workers tunnel into the roots to which the plants succumb.
2. Cockchafer—*Anomala varians* O. (*Rutelidae*). Minor pest, the grubs feed on the roots; active from April to June.

B. LEAF FEEDING.

I. Biting :

1. Grasshopper—*Hieroglyphus banian* Fb. var. *elongata* (*Acridiidae*). Major pest specially in Deccan. Nymphs and adults feed on leaves; only one brood active from June to October.
2. Army worm—*Cirphis unipuncta* H. (*Noctuidae*). Major pest all over the province. Caterpillars move in swarms and feed on leaves; there may be two to three generations from June to November; hibernates as pupa in the soil.

II. Sucking :

1. White-flies—*Aleurolobus barodensis* W. and *Neomaskellia bergi* S. (*Aleyrodidae*) Minor pest practically all over the province. Nymphs feed on the sap which might result in withering of the leaves; active from July to December giving rise to formation of conspicuous black mould.
2. Leaf hopper—*Pyrilla aberrans* Kby. (*Fulgoridae*). Major pest all over the province. Nymphs and adults feed on the sap and cause withering of the leaves. 'Honey dew' secreted by the insects develops black mould which gives sooty appearance to leaves. Active from April to May and from August to February.
3. Mealy bug—*Trionymus sacchari* Gr. (*Coccidae*). Minor pest in Deccan. Nymphs and adults feed at the base of the leaves and consequently the crop loses vigour.
4. Black bug—*Assamia moesta* Westw. (*Fulgoridae*). Minor pest, probably active from July to December.

C. BORERS.

1. Stem borer—*Argyria sticticrasis* Hamp. (*Pyralidae*). Major pest all over the province. The caterpillars bore into the stem and the plants in earlier stages may die; active from April to August during which period, three to four generations may occur.

2. Top-shoot borer—*Scirpophaga nivella* F. (*Pyralidae*). Minor pest recorded from Deccan area; caterpillars bore from the top and work downward; shoots may assume bunchy appearance.

3. Pink stem borer—*Sesamia inferens* W. (*Noctuidae*). Occasionally may assume the status of a major pest. Caterpillars bore into the stem; there may be 4-6 generations in a year; active from July to February.

Jowar.

Andropogon sorghum. Sown in June and September to November, and harvested from November to December and February-March. Fodder crop in March-June.

A. ATTACKING ROOTS.

1. White ants—Termites (*Termitidae*). Major pest. (vide *Sugarcane*).
2. Cockchafer—*Anomala varians* O. Minor pest. (vide *Sugarcane*).

B. LEAF FEEDING.

I. Biting :

1. Lucerne caterpillar—*Laphygma exigua* Hb. (*Noctuidae*). Minor pest; the caterpillars feed on leaves especially during the months of January and February.

2. Katra—*Amsacta moorei* B. (*Arctiidae*). Major pest, recorded in North Gujarat. Caterpillars defoliate all the plants. There is only one generation during June-July; hibernates as pupa in the soil.

3. Deccan wingless grasshopper—*Colemania sphenariodes* Bol. (*Acridiidae*). Major pest attacking crops only in Karnatak and Deccan. Both nymphs and adults feed on leaves, and there is only one generation from June to October.

4. White banded grasshopper—*Epacromia dorsalis* Thumb. (*Acridiidae*). Major pest in Deccan only. Both nymphs and adults feed on leaves and defoliate the germinating seedlings.

5. Surface grasshopper—*Chrotogonus lugubris* B. (*Acridiidae*). Major pest, recorded from all over the province. Nymphs and adults feed on leaves, and the pest is active almost throughout the year. It also damages various other crops such as Bajri, maize, etc.

6. Army worm—*Cirphis unipuncta* H. Minor pest. (vide *Sugarcane*).

II. Sucking :

1. Aphides—*Aphis maidis* F. (*Aphidiidae*). Major pest active from August—February. The insects suck the plant juice and the plants lose vitality. Various predators and black ants are always associated with the attack.

2. Green bug—*Nezara viridula* L. (*Pentatomidae*). Minor pest found on tender shoots and earheads. The attack is not very serious.

3. Jowar stem bug—*Pundaluoya simplicia* Dt. (*Fulgoridae*). Major pest, invariably found on the tender shoots. Nymphs and adults feed on the sap which results in withering of the plants; active from August—February.

4. Mites—*Paratetranychus indicus* H. Major pest which gives reddish or rusty appearance to the foliage; active from August—February.

5. Leaf hopper—*Pyrilla aberrans* Kby. Major pest. (vide *Sugarcane*).

C. BORERS.

1. Jowar borer—*Chilo zonellus* S. (*Pyralidae*). Major pest, practically all over the province. The caterpillars bore into the stem and cause the death of the plant in early stages. There are 4-6 generations from May to February.

2. Pink borer—*Sesamia inferens* Wlk. Major pest. (vide *Sugarcane*).

3. Stem fly—*Atherigona indica* M. (*Anthomyiidae*). Major pest all over the province; active from May to February. The maggots bore into the young seedlings and bring about their death.

D. GRAIN FEEDERS.

I. Biting :

1. Blister beetles—*Lytta tenuicollis* P. and species. (*Meloidae*). Adult beetles feed on blossom and do not allow them to develop into seeds; active from August to October.

2. Khas disease—*Contarinia andropogonis* F. (*Cecidomyiidae*). Minor pest. The maggots breed inside the tender ears as a result of which they are hollowed out; active during January—February.

II. Sucking :

1. Capsid bug—*Calocoris angustatus* L. (*Capsidae*). Minor pest. The nymphs and adults which are just like mosquitoes, feed on the sap as a result of which the grains get shrivelled; active from December—February.

Maize

Zea mays. Sown at any time, harvested 3-4 months after sowing.

A. ATTACKING ROOTS.

1. White ants—*Termites*. Major pest. (vide *Sugarcane*).

B. LEAF FEEDERS.

I. Biting :

1. Army worm—*Cirphis unipuncta* H. (*Noctuidae*). Major pest. (vide *Sugarcane*).

2. Deccan wingless grasshopper—*Colemania sphenarioides* B. Major pest. (vide *Jowar*).

3. Banded grasshopper—*Epacromia dorsalis* Thumb. (*Acridiidae*) Minor pest. (vide *Jowar*).

4. Kutra—*Amsacta moorei* Butl. (*Arctiidae*). Major pest. (vide *Jowar*).

5. Surface grasshopper—*Chrotogonus lugubris* B. (*Acridiidae*). Minor pest. (vide *Jowar*).

II. Sucking :

1. Stem bug—*Pundaluoya simplicia* Dt. (*Fulgoridae*). Major pest. (vide *Jowar*).

C. BORERS.

1. Jowar borer—*Chilo zonellus* S. (*Pyralidae*). Major pest. (vide *Jowar*).

2. Pink borer—*Sesamia inferens* W. (*Noctuidae*). Major pest. (vide *Jowar*).

Wheat

Triticum vulgare. Sown in September to November and harvested from February—March.

A. ROOT FEEDERS.

1. White ants (*Termites*). Major pest. (vide *Sugarcane*).

B. LEAF FEEDERS.

1. Aphides. Major pest. (vide *Jowar*)

C. BORERS.

1. Jowar borer—*Chilo zonellus* S. (vide *Jowar*).

2. Pink borer—*Sesamia inferens* W. (vide *Jowar*).

Bajri.

Pennisetum typhoideum. Sown in June and harvested from September to October.

A. ROOT FEEDERS.—NONE.

B. LEAF FEEDERS.

I. Biting :

1. Deccan wingless grasshopper—*Colemania sphenarioides* B. Major pest. (vide *Jowar*).
2. Kutra—*Amsacta moorei* B. Major pest. (vide *Jowar*)
3. Army worm—*Cirphis unipuncta* H. Major pest. (vide *Jowar*).
4. Hairy caterpillar of Satara—Unidentified. Major pest. only recorded from this district. It is commonly known as 'Lodh'. Caterpillars feed on leaves and there is only one generation a year during July—August. The pest hibernates as pupa, in the soil.
5. Grasshoppers—*Chrotoganus* sp. and *Epacromia* sp. (vide *Jowar*).

II. Sucking : None.

C. BORERS.

1. Jowar borer—*Chilo zonellus* S. (vide *Jowar*)
2. Pink borer—*Sesamia inferens* W. (vide *Jowar*).
3. Stem fly—*Atherigona indica* M. (*Anthomyiidae*) (vide *Jowar*).

D. GRAIN FEEDERS.

1. Blister beetles—*Lytta* sp., *Zonabris* sp. etc. (*Meloidae*). Major pest. (vide *Jowar*)

Paddy.

Oryza sativa. Sown in June; transplanted in July—August; harvested from November to January.

A. ATTACKING ROOTS.

1. Cockchafer—*Anomala varians* O. Minor pest. (vide *Sugarcane*).
2. Cockchafer—*Phyllognathus* sp. (*Dynastidae*). Minor pest.

B. ATTACKING SEEDLINGS.

1. Crabs—*Paratelpusa* sp. (*Crustacea*). Major pest in Konkan area. Both adults and young ones feed on the nursery as well as the transplanted seedlings. Their burrowing in the bunds causes leakage of water; active during the rainy season.

C. LEAF FEEDING.

I. Biting :

1. Swarming caterpillar—*Spodoptera mauritia* B. (*Noctuidae*). Major pest all over the rice growing tract. The caterpillars feed on rice and other grasses. Only one generation during June—August. The pest hibernates as pupa in the soil.
2. Army worm—*Cirphis albistigma* M. (*Noctuidae*). Major pest in Ratnagiri district. The caterpillars feed on leaves and the pest hibernates as pupa in the soil. There are 2-3 generations from July-September.
3. Rice hispa—*Hispa armigera* Q. (*Chrysomelidae*). Major pest in Karwar and Belgaum districts. The grubs and adults feed on green matter and cause withering of plants. Both the *Kharif* and *Rabi* crops of paddy are attacked and damaged.
4. Blue beetle of Rice—*Leptispa pygmaea* B. (*Chrysomelidae*). Major pest in Karwar, Belgaum and Ratnagiri districts. Both grubs and adults feed on the green matter and the plants succumb to their attack. Both the *Kharif* as well as the *Rabi* crops are attacked and damaged.
5. Rice grasshopper—*Hieroglyphus banian* Fb. var. *elongata*. Minor pest. (vide *Sugarcane*).
6. Rice butterfly—*Melanitis ismene* C. (*Nymphalidae*). Minor pest. The caterpillars are occasionally found feeding on leaves.

7. Rice skipper—*Chapra mathias* Fb. (*Hesperidae*). Occasionally the caterpillars are found feeding on leaves.

8. Rice case worm—*Nymphula depunctalis* G. (*Pyralidae*). Minor pest. The caterpillars prepare cases from cut out leaf blades and feed when concealed in the rolls. These are semi-acquatic in habit and two generations are passed from June to August.

II. Sucking:

1. Rice leaf hopper—*Nephotettix bipunctatus* Fb. (*Jassidae*). Minor pest, only recorded from North Gujarat.

2. Rice mealy bug—*Ripersia oryzae* Gr. (*Coccidae*). Minor pest occasionally found in colonies on the stem under leaf sheaths. The attacked plants are practically devoid of vitality, appear sickly and generally wither out without developing earheads.

D. BORERS.

1. Rice stem borer—*Schoenobius bipunctifer* Wlk. (*Pyralidae*) Major pest. The caterpillars bore into the stem as a result of which the central growing leaf is killed. When the attack is at flowering stage the bearing is very poor and results in empty earheads. There are 3-4 generations from May to December.

2. Pink borer—*Sesamia inferens* W. Minor pest. (vide *Sugarcane*).

3. Rice gall-fly—*Pachytiplosis oryzae* W. (*Cecidomyiidae*). Major pest, recorded from Belgaum, Karwar and Ratnagiri districts. The maggots bore into the stem as a result of which hollow outgrowths known as 'silvery shoots' are developed. Such plants do not bear earheads. The pest is active from May to December.

E. FEEDING ON EARHEADS.

1. Blister beetles—*Lytta* sp. and *Epicauta*. Sp. Minor pest. (vide *Jowar*)

2. Rice bug—*Leptocorisa acuta* Th. (*Coreidae*). Minor pest, damaging the earheads, met with in Belgaum and Karwar districts. Practically no grains are formed in the attacked inflorescence. Both the *Kharif* and *Rabi* crops are attacked.

Cotton.

Cosyppium sp. Sown early in July-August, picking from December to March.

A. ATTACKING ROOTS.

1. White ants—*Termites*. (vide *Sugarcane*).

B. LEAF FEEDING.

I. Biting :

1. Lucerne caterpillar—*Laphygma exigua* H. Minor pest. (vide *Jowar*)

2. Surface grasshopper—*Chrotogonus* sp. Minor pest. (vide *Jowar*)

3. White weevil—*Mylocherus 11-pustulatus* var. *maculosus* Fst. (*Curculionidae*). Minor pest. Occasionally found feeding on the leaves. All the immature stages are found in the soil.

4. Bhindi caterpillar—*Acontia* sp. (*Noctuidae*). Minor pest. Occasionally green semi-loopers are found feeding on cotton leaves, the pest is active from June to October. The adult moths have bright lemon yellow wings.

5. Cotton semi-looper—*Cosmophila indica* Gn. (*Noctuidae*). Minor pest. The semi-loopers are green but the adults have brownish wings. Considerable damage has been recorded to cotton leaves in Surat district.

6. Cotton semi-looper—*Tarache nitidula* F. (*Noctuidae*). Minor pest. Adults with white wings decorated with dark markings, semi-looper dark brown, found damaging the leaves; commonly met with from June to October.

7. Cotton leaf roller—*Sylepta derogata* Fb. (*Pyralidae*). Minor pest occurring all over the province. Caterpillars lead a hidden life in the rolled up

leaves and feed on the green matter. There are 3-4 generations from June to December.

8. Cotton grasshopper—*Cyrtacanthacris ranacea* S. (*Acridiidae*). Minor pest. Both nymphs and adults feed on leaves from June to February.

9. Bud caterpillar—*Phycita infusella* M. (*Pyralidae*). Minor pest. The caterpillars are found feeding on buds and top leaves. This results in the fading of top shoots. Active from September to November.

II. Sucking:

1. Red Cotton bug—*Dysdercus cingulatus* Fb. (*Pyrrhocoridae*). Major pest, sucking the sap from the buds and bolls. Their feeding strains the lint. There are 5-6 generations from August to March.

2. Dusky cotton bug—*Oxycarenus loetus* K. (*Lygaeidae*). Major pest. The nymphs and adults are found feeding inside the bolls where quite a large number of these insects is seen at a time. There are 4-5 generations from October to March.

3. Cotton aphid—*Aphis gossypii* G. (*Aphidiidae*). Major pest. It is found on the under side of the leaves. The infested plants show poor growth or in severe cases they even wither away. The sooty mould develops on the 'honey dew' and interferes with photosynthesis. The pest is active from July to March.

4. Cotton jassid—*Empoasca* spp. (*Jassidae*). Major pest, found all over the province. The nymphs and adults feed on the sap and reduce the vitality of the plants. Breeding continues throughout the year. Active from July to March.

5. Mealy wings—*Bemisia tabacci* Genn. (*Aleyrodidae*). Minor pest. Both nymphs and adults feed on the sap and in some severe cases cause the withering of the plant. The pest is noticed in large numbers during November to March, malnutrition results in shedding of flowers and bolls.

6. Mealy bugs—*Pseudococcus* sp. (*Coccidae*). Minor pest. The fleshy insects covered over with cottony mass, feed on the sap. The pest is active from November to March.

7. Woolly mites—*Eriophyes gossypii*. Minor pest. These are found feeding on the stem and the underside of leaves. Usually these are found covered over with brown woolly fibers as the name indicates. Active from August to February.

C. BORERS.

1. Spotted boll worm—*Earias fabia* F. and *Earias insulana* B. (*Noctuidae*). Major pest. The caterpillars are black with white irregular patches. They bore into the top shoots, buds and bolls. The attacked bolls have punctures which are prominent because of the excreta; active throughout the season.

2. Pink boll worm—*Platyedra gossypiella* S. (*Gelechiidae*). Major pest; caterpillars, pink in colour, they bore into the bolls and feed on seed. Active from September to March.

3. Stem borer—*Sphenoptera gossypii* K. (*Buprestidae*). Minor pest. The grubs bore into the stem near the ground level and cause slight swelling. In serious cases the attacked plants may die.

Sann hemp.

Crotalaria juncea. Sown in June. Harvested from October to November.

A. ROOT FEEDERS—NONE.

B. LEAF FEEDERS.

I. Biting:

1. Sann leaf caterpillar—*Utetheisa pulchella* L. (*Arctiidae*). Major pest. The hairy caterpillars feed on leaves and defoliate the plants. Pupation either in the leaf folds or in the soil. There are 3-4 generations from June to September.

II. Sucking:

1. Leaf hopper—*Empoasca* sp. (*Jassidae*). Minor pest. (vide Cotton).

C. BORER.

1. Shoot borer—*Laspeyresia pseulonectis* Meyr. (*Eucosmirae*). Occasionally recorded as a minor pest. The caterpillars bore into the shoots and are active during July and August.

Tobacco.

Nicotiana tabacum. Seedlings raised from July to August; transplanted in September; harvested from January to February.

A. ROOT FEEDERS—NONE.

B. LEAF FEEDERS.

I. Biting :

1. Surface grasshopper—*Chrotogonus* sp. Minor pest. (vide *Jowar*)
2. Tobacco caterpillars—*Prodenia litura* F. (*Noctuidae*). Minor pest. Black and stout caterpillars are occasionally seen feeding on leaves. Pupation in the soil. There are 3-4 generations from September to January.
3. Cut worms—*Agrotis ypsilon* Rott. (*Noctuidae*). Black and stout caterpillars remain hidden in the soil during day and cut the plants near the ground level at night, and feed on the leaves. There may be 2-3 generations from August to October.
4. Brown cricket—*Brachytrypes portentosus* Licht. (*Gryllidae*). Minor pest. The adults cut the plants near the ground level and feed on them. Damage is serious during September.

C. BORERS.

1. Stem borer—*Gnorimoschema (Phthorimaea) heliopa* L. (*Gelechiidae*). Major pest. Small caterpillars bore into the stem and may cause the death of the plant. Two generations are passed in a season.

Potato

Solanum tuberosum. Planted in July and November; harvested in September and February.

A. LEAF FEEDING.

I. Biting :

1. Cut worm—*Agrotis ypsilon* Rott. Major pest. (vide *Tobacco*).

II. Sucking :

1. Leaf hopper—*Empoasca* sp. Major pest. (vide *Cotton*).

B. BORERS.

1. Tuber moth—*Gnorimoschema operculella* Z. (*Gelechiidae*). Major pest. Dirty white caterpillars bore into the tubers and occasionally the buds. Externally black excreta is seen at the eyes. There are about 4-6 generations throughout the year. The pest is more serious during the hot months.

Cucurbits.—Sown in June, October and February; harvested from time to time.

A. LEAF FEEDING.

I. Biting :

1. Pumpkin beetles—*Aulacophora abdominalis* Fb. and *Aulacophora excavata* Fb. (*Chrysomelidae*). Major pest. Red and black beetles are seen feeding on leaves which are badly damaged. The germinating seedlings when attacked are practically destroyed. The immature stages are found in the soil. The grubs cause appreciable damage by boring into the roots and stems as well as the fruits which come in contact with the soil. The pest is active from March to October.
2. Epilachna beetle—*Epilachna 28 puncta* F. and *Epilachna 12 puncta* M. (*Coccinellidae*). Major pest. The adults are orange coloured with 12 or 28 black dots on the body, while the grubs are hairy and both the adults and grubs feed on the underside of leaves. The adults eat leaf areas while the grubs feed on the leaf tissue, imparting ragged appearance. There may be 3 generations from July to September.

II. Sucking :

1. *Aphis malvae* K. Major pest. (vide *Jowar*)

III. Feeding on flowers :

1. Banded blister beetles—*Zonabris postulata* Thunb. Minor pest. (vide *Bajri*).

B. BORERS.

1. Fruit fly—*Chaetodacus cucurbitae* Coq. *Chaetodacus zonatus* S. (*Trypae-nidae*). Major pest. White legless maggots bore into the fruits and cause their rotting. Pupation takes place in the soil. There may be 6 generations from May to January, but they overlap.

Cruciferous vegetables.

Both *Kharif* as well as *Rabi*.

I. Leaf feeding :

1. Diamond back moth—*Plutella maculipennis* C. (*Plutellidae*). Minor pest. Slender green caterpillars bite holes and feed on the foliage where they pupate. Active both on *Kharif* and *Rabi* crops.
2. Lucerne caterpillar—*Laphygma exigua* Hb. Minor pest. (vide *Jowar*)
3. Tobacco caterpillar—*Prodenia litura* F. Major pest. (vide *Tobacco*).
4. Mustard saw-fly—*Athalia proxima* K. (*Tenthredinidae*). Major pest. The grubs are black, which feed on the underside of leaves and drop down with the slightest touch. The damage is done by biting holes and skeletonising the leaves. Active from June to November.

Brinjal.

Solanum melongena. Seedlings raised in June—July, and October—December. Harvested when the fruits are ready.

A. LEAF FEEDING.

I. Biting :

1. Epilachna beetle—*Epilachna dodecastima* M. and *Epilachna* 28 *punctata* F. Minor pest. (vide *Cucurbits*).
2. Leaf roller—*Eublemma olivacea* W. (*Noctuidae*). Minor pest. The green caterpillar rolls the leaves and leads a concealed life. The pest is commonly met with in the winter crop.

II. Sucking:

1. *Aphis-Myzus persicae* S. Minor pest. (vide *Jowar*).

B. BORERS.

1. Stem borer—*Euzophera perticella* Rag. (*Pyralidae*). Minor pest. Caterpillars bore into the stem and may kill the plant. Generally attacks winter and summer crops. It is also recorded boring into tomato plants.
2. Fruit borer—*Leucinodes orbonalis* G. (*Pyralidae*). Major pest. Caterpillars pink, bore in the top shoots as well as the fruits which are rendered unremarkable. Winter crop is damaged severely. One generation may take 4-5 weeks.

Sweet potato.

Ipomoea batatas. Grown throughout the year.

A. LEAF FEEDERS.

I. Biting :

1. Hawk moth—*Herse convolvuli* L. (*Sphingidae*). Minor pest. The caterpillar is stout and grey, provided with an anal horn. It feeds on the leaves and damages them. Commonly met with from July to October. One life-cycle occupies 10-12 weeks; pupation in the soil.

B. BORERS.

1. Tuber weevil—*Cylas formicarius* Fb. (*Curculionidae*). Major pest. Both the adults and grubs tunnel into the tubers and cause their rotting. Occa-

sionally the vines may also be damaged which wither ultimately. The adults may also feed on the leaves.

Chillies.

Capsicum. Seedlings raised during June-July; transplanted July-August and harvested October-February.

A. LEAF FEEDERS.

I. Biting :

1. Lucerne caterpillar—*Laphygma exigua* Hb. Minor pest. (vide *Jowar*).

II. Sucking :

1. Thrips—*Thrips tabaci* L. (*Thripidae*). Major pest. Minute, pale insects feed on the underside of leaves and cause their curling. In severe cases the plants absolutely wither out.
2. Mites—Major pest. Damage similar to that of thrips.

Betelvine.

Piper betel. Perennial crop. Plucked when ready for harvest.

A. LEAF FEEDERS.

I. Sucking :

1. Leaf-bug—*Disphinctus maesarum* Kirk. (*Capsidae*). Major pest. Both the nymphs and the adults suck the sap from leaves as a result of which black spots appear. Active from June-December. Each generation may occupy 4-6 weeks.

OIL SEEDS

Groundnut.

Arachis hypogea. Sown in June-July; harvested during November-December.

A. ROOT FEEDERS.

1. White ants. (vide *Sugarcane*).

B. LEAF FEEDERS.

I. Biting :

1. Leaf roller—*Anartia ephippias* Meyr. (*Gelechiidae*). Minor pest. Caterpillars roll the leaves and feed inside.

II. Sucking :

1. Pod bug—*Aphanus sordidus* F. (*Lygaeidae*). Minor pest. Both the nymphs and adults suck the oil from the pods which give out rancid smell. One generation takes about 4-5 weeks. It is more a pest in the store than in the field.

Castor.

Ricinus communis. Sown in June or September; harvested in September and February.

A. LEAF FEEDERS.

I. Biting :

1. Castor semi-looper—*Archoea janata* (*Noctuidae*). Major pest. Black caterpillars feed on leaves and skeletonise them. Active from June-October. One generation occupies 4-5 weeks. Pupation in the soil.
2. Hairy caterpillar—*Pericallia ricini* F. (*Arctiidae*). Minor pest. Brown hairy caterpillars feed gregariously on leaves. Active from June-October. Pupation in the soil.
3. Castor butterfly—*Ergolis merione* Cr. (*Nymphalidae*). Minor pest. The caterpillars feed on leaves, and occasionally may defoliate the plants.
4. Woolly caterpillar—*Trabala vishnu* Lef. (*Lasiocampidae*). Minor pest. Small woolly caterpillars feed on leaves during the *Kharif* season only. It is generally a sporadic pest.
5. Slug caterpillar—*Parasa lepida* Cr. (*Limacodidae*). Minor pest. The young larvae are gregarious, later on they live solitary life. The white shell-like cocoons are found clustered on stems.

II. Sucking :

1. Mealy wings—*Trialeurodes ricini* M. (*Aleyrodidae*). Minor pest. Nymphs feed on the underside of the leaves on which black mould develops. All the stages are found on the leaves during the growing period of the plants.
2. Leaf hopper—*Empoasca* sp. Minor pest. (vide *Cotton*).

B. BORERS.

1. Shoot and capsule borer—*Dichocrocis punctiferalis* G. (*Pyralidae*). Occasionally a serious pest. Dark brown caterpillars bore and cut the tender shoots and also web the seeds. Pupation in silken cocoon in the shoot or capsule.

Sesamum.

Sesamum indicum. Sown from June, harvested from September.

A. LEAF FEEDERS.

I. Biting :

1. Leaf roller—*Antigastra catalaunalis* D. (*Pyralidae*). Minor pest. Small greenish caterpillars with dark tubercles; roll up and web the leaves and may also bore in the shoots and pods. Considerable damage may be caused in the seedling stage. Active from July-September.

II. Sucking :

1. Pod bug—*Aphanus sordidus* F. (vide *Groundnut*).

B. BORERS.

1. Gall-fly—*Asphondylia sesami* Felt. (*Cecidomyiidae*). Minor pest. The adults are like mosquitoes. The maggots bore into the flower buds or stem and produce gall-like structures.
2. Leaf caterpillar—*Acherontia styx* West. (*Sphingidae*). Minor pest. Stout and green caterpillars with anal horn, feed on leaves. There are two generations from July-December. Pupation in the soil.

PULSES.

Tur.

Cajanus indicus. Sown from July and harvested from December.

A. LEAF FEEDERS.

I. Biting :

1. Aphis—*Aphis medicaginis* Koch. Minor pest. (vide *Jowar*).

B. BORERS.

1. Pod borer—*Exelastes atomosa* W. (*Pterophoridae*). Major pest. The caterpillars are greenish brown, slightly hairy. They bore into the pods and feed on the seeds. Pupation on the pods. One generation occupies about 3-4 weeks.
2. Gram pod borer—*Heliothis obsoleta* F. Minor pest. (vide *Gram*).
3. Pod butterfly—*Catochrysope* (*Enchrysope*) *Cnejus* Fb. (*Lycaenidae*). Minor pest. Green slug-like caterpillars feed on pods and damage the contents.
4. Podfly—*Agromyza obtusa* M. (*Agromyzidae*). Major pest. The maggots bore into the seeds when they are green. Attacked pods present a shrivelled appearance. One generation occupies about 3 weeks.

II. Sucking :

1. Podbug—*Riptortus linearis* F. (*Coreidae*). Minor pest. Dark brown bugs feed on the sap from the pods and cause their shrivelling. Active from September-March.

2. Podbug—*Clavigralla gibbosa* S. (*Coreidae*). Major pest. Small sized bugs, brown in colour. There are 4-5 generations from November-March and each cycle may occupy about 4 weeks.

Gram.

Cicer arietinum.

A. LEAF FEEDERS.

I. Biting :

1. Cut worm—*Agrotis ypsilon* Rott. Major pest. (vide *Cruciferous vegetables*).

B. BORERS.

Pod borer—*Heliothis obsoleta* F. Major pest. The young caterpillars feed on foliage and when grown up enter the Pods and destroy the seeds. Pupation in an earthen cocoon in the soil. There may be 4-6 generations in a year.

Peas.

Pisum sativum.

A. LEAF FEEDERS.

I. Biting :

1. Lucerene caterpillar—*Laphygma exigua* Hb. (vide *Jowar*).
2. Tobacco caterpillar—*Prodenia litura* F. (vide *Tobacco*).

II. Sucking :

1. Aphis—*Macrosiphum pisi* Kalt. Major pest. (vide *Jowar*).

B. BORERS.

1. Pod borer—*Heliothis obsoleta* F. Major pest. (vide *Gram*).

Mung.

Phaseolus radiatus.

A. LEAF FEEDERS.

1. Hawk moth—*Herse convolvuli* L. Minor pest. (vide *Sweet potato*).

PEST OF FRUITS AND FRUIT TREES.

Mango.

Mangifera indica.

A. AFFECTING ROOTS.

1. White ants—*Termites* sp. Major pest. (vide *Sugarcane*).

B. LEAF FEEDERS.

I. Biting:

1. Slug Caterpillars—*Parasa lepida* Cram. (*Limacodidae*). Minor pest. Caterpillars feed on leaves, mostly found on mango during December-March. Round shell-like cocoons are found in clusters on tree-trunks. The larval spines cause considerable itching if handled without covering the hands.
2. Leaf caterpillar—*Euthalia garuda* M. (*Nymphalidae*). Minor pest. Beautiful green caterpillars are observed feeding on the leaves. The pest may be found throughout the year.
3. Mango leaf webbing caterpillar—*Orthaga exvinacea* W. (*Noctuidae*). Minor pest. The caterpillars bind the leaves with silken threads and feed on green tissue. Often the damage is serious during August to March.

II. Sucking :

1. Mango hopper—*Idiocerus atkinsoni* L., *Idiocerus niveosparvus* L. and *Idiocerus clypealis* L. (Jassidae). Major pests. Both the nymphs and adults feed on the sap of tender leaves and inflorescence as a result of which the flowers fall off without setting any fruits. 'Honey dew' secreted by the insects develops sooty mould and imparts blackish appearance to the plants. Breeding takes place twice during December-February and June and July. One generation occupies about 2-3 weeks.

2. Coccids. Major pest in three species. Both the nymphs and adults feed on sap. They cover the fruits and twigs in serious cases. Their presence attracts red ants.

C. BORERS.

I. Soot borers :

1. Mango shoot borer—*Chlumetia transversa* W. (Noctuidae). Major pest. The caterpillars bore into the growing shoots. Young grafted seedlings are severely damaged and may even be killed. Active from July—December.

2. Leaf and twig miner—*Acrocercops* sp. (Gracillariidae). Minor pest. The caterpillars attack very young leaves and fresh twigs. In case of seedlings some damage takes place. Active from November-April.

3. Castor capsule borer—*Dichrocrocis punctiferalis* G. Minor pest. (vide *Castor*).

II. Stem borers :

1. Mango stem borer—*Batocera rubus* L. (Cerambycidae). Major pest. The grubs bore into stems or branches as a result of which the plant may ultimately die. The pest is active throughout the year, one generation may take more than 12 months.

2. Branch borer—*Arbela tetraonis* M. (Arbelidae). Minor pest. The caterpillars occasionally bore into the branches and cause their death. It attacks various other trees besides mango.

III. Fruit borers :

1. Fruit flies—*Chaetodacus ferrugineus* F. and *Chaetodacus zonatus* S. and varieties of *Chaetodacus ferrugineus*. Minor pests. The maggots bore into the ripening fruits and render them useless for consumption. Pupation takes place in the soil. There may be 2-3 generations during the mango season. They also attack many other fruits.

D. GENERAL PESTS.

1. Red ants—*Oecophylla smaragdina* Fb. (Formicidae). They do not cause any direct damage to the plant but indirectly protect the coccids and white flies and cause their spread all over the plantation which results in considerable damage. They are also a nuisance at the time of harvest.

Pomegranate.

Punica granatum.

A. ROOT FEEDERS—NONE.

B. LEAF FEEDERS.

I. Biting:

1. Castor semilooper—*Archoea janata* L. (Noctuidae). Minor pest. The caterpillars are black which occasionally feed on leaves and defoliate the plants. Pupation takes place in the soil. The pest is active from June—December, during which period 3-4 generation are passed.

II. Sucking :

1. *Aphis*. Minor pest. Both the adults and nymphs suck the sap especially from tender shoots and reduce the vitality of the plants. Active practically throughout.

2. Coccids. Minor pest. Both the nymphs and adults feed on leaves and tender shoots and in serious cases the plants may wither.

C. BORERS.

1. Fruit borer—*Virachola isocrates* F. (*Lycænidæ*). Major pest. The caterpillars are black which bore into the fruits and render them inedible. The damage continues throughout the year and one generation occupies about 4–6 weeks.

Citrus.

Citrus sp.

A. ROOT FEEDING.

1. White ants—*Termites* sp. Minor pest. (vide *Sugarcane*).

B. LEAF FEEDING.

I. Biting:

1. Lemon butterfly—*Papilio demoleus* L. (*Papilionidæ*). Minor pest. The caterpillars are green in colour and feed on leaves. In nurseries the seedlings may be absolutely defoliated. The pupae stick to the leaves, and the adults are noticed throughout the year.

2. Leaf miner—*Phyllocnistis citrella* S. (*Lyonetiadæ*). Minor pest. The caterpillars mine the leaves and feed in between two epidermal layers. The damage continues throughout the year.

II. Sucking :

1. Coccids—*Chrysomphalus aonidum* Riley, and *Pseudococcus citri* R. Major pests. Both leaves and fruits are attacked. The infested fruits lose attraction. The second species may also attract the red ants.

2. White flies—*Dialeurodes citri* A. (*Aleyrodidæ*). Major pest. Black nymphs are seen feeding on the underside of leaves. 'Honey dew' secreted by the pest develops sooty mould which interferes with the photosynthesis. Active from October—February.

3. Aphis—*Toxoptera aurantii* Boy. Major pest. Both the adults and nymphs feed on the sap of growing shoots and in severe cases the growth of the plant is considerably checked. Active practically throughout the year.

C. FRUIT SUCKING.

1. Fruit sucking moths—*Ophideres fullonica* L. and *Ophideres materna* L. (*Noctuidæ*). Major pest. The caterpillars feed on some wild plants. The adults are the real pests since they puncture the fruits and feed on the juice. The fruits thus damaged begin to rot and drop down. Active from July to October.

D. BORERS.

1. Fruit fly—*Chaetodacus ferrugineus* F. and *varieties*. Minor pest. (vide *Mango*).

2. Red ants—*Oecophylla smaragdina* F. Major pest. (vide *Mango*).

Guava.

Psidium guava.

A. LEAF SUCKING.

1. Mealy bugs—*Pulvinaria psidii* M. (*Coccidæ*). Major pest. The nymphs and adults feed on leaf sap. Sooty mould is developed on the 'Honey dew' secreted by them and the entire plant becomes black and sticky.

B. BORERS.

1. Stem borer—*Arbela tetraonis* Mo. Minor pest. (vide *Mango*).

2. Castor capsule borer—*Dichocrosis punctiferalis* G. (*Pyralidæ*). Minor pest. (vide *Castor*).

Grapevine.

Vitis vinefera.

A. LEAF FEEDERS.

I. Biting:

1. Leaf beetle—*Scelodonta strigicollis* Mots. (*Chrysomelidae*). Major pest. The adults feed on growing shoots and leaves. They resemble 'Udid' grain and therefore known as *Udadya beetles*. The immature stages are passed in the soil and the damage after October pruning is most serious.

2. Cockchafer beetle—*Adoretus ovalis* Bl. Minor pest. (vide *Sugarcane*).

II. Sucking:

1. Thrips—*Rhipiphorothrips cruentatus* H. (*Thripidae*). Minor pest. The nymphs and adults feed on leaf sap and in severe infestation the shoots may wither away.

Plantain.

Musa sapientum.

A. LEAF FEEDERS.

1. Tobacco caterpillar—*Prodenia litura* F. Minor pest. (vide *Tobacco*).

2. Hairy caterpillar—*Pericallia ricini* F. (*Arctiidae*). Minor pest. Brown hairy caterpillars feed gregariously on the leaves. Only one generation attacks the plantation during July and August.

B. BORERS.

1. Stem and root borer—*Cosmopolites sordidus* G. (*Curculionidae*). Minor pest. Dirty white, legless grubs bore into the roots and stem. The adults are black with a conspicuous snout. Breeding takes place throughout the year.

Coconut palm.

Cocos nucifera.

A. LEAF FEEDERS.

I. Biting:

1. Black headed caterpillar—*Nephantis serinopa* M. (*Xyloryctidae*). Major pest. The caterpillars prepare galleries of their own excreta and lead hidden life on the underside of leaves. The damaged leaf appears as if scorched. One generation occupies about 5-6 weeks. Active during the monsoons.

B. BORERS.

I. Soot borers:

1. Palm beetle—*Oryctes rhinoceros* L. (*Dynastidae*). Major pest. Adults are black beetles with a horn-like projection on the head, shining above and hairy below. They bore into the growing shoots and kill the fronds. The immature stages are met with in the manure pits. Only one generation in a year.

1. Palm weevil—*Rhynchophorus ferrugineus* F. (*Curculionidae*). Major pest. The adult is reddish-brown weevil. The grub bores into the growing shoots and damages them seriously.